ACCESSION #: 9112060194
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Pilgrim Nuclear Power Station PAGE: 1 OF 12

DOCKET NUMBER: 05000293

TITLE: Loss of Preferred and Secondary Offsite Power Due to Severe Coastal Storm While Shutdown
EVENT DATE: 10/30/91 LER #: 91-024-00 REPORT DATE: 11/29/91

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 000

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(i)(B) & 50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Douglas W. Ellis - Senior Compliance Engineer TELEPHONE: (508) 747-8160

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On October 30, 1991 at 1942 hours a loss of preferred offsite 345 KV power occurred while shut down during a severe coastal storm. The loss of preferred offsite power resulted in designed responses including automatic actuations of the Reactor Protection System, Primary and Secondary Containment Isolation Control Systems, and Emergency Diesel Generators.

The cause of the loss of preferred offsite power was the flashover of a 345 KV switchyard insulator, and separate operation of a stuck breaker circuit. The flashover caused three switchyard air circuit breakers (ACBs) to open as designed. A fourth ACB opened about 1.4 seconds later (stuck breaker circuit) even though the related ACB opened as designed. The most probable cause of the stuck breaker circuit operation was 345 KV electrical noise coupled into the stuck breaker circuit. Corrective actions planned include the installation of a high speed recorder to

monitor switchyard circuitry. A loss of the secondary source of offsite power occurred at 1953 hours and an Unusual Event was declared at 2003 hours. The cause of the loss of secondary offsite power (23 KV) was also storm related, when a tree fell onto a 23 KV line. Preferred offsite power was restored at 2142 hours and the Unusual Event was terminated at 2230 hours. The loss of preferred offsite power occurred about two and one-half hours after a shutdown with the reactor mode selector switch in the REFUEL position. The Reactor Vessel (RV) pressure was approximately 920 psig with the RV water temperature at 530 degrees Fahrenheit. This report is submitted in accordance with 10 CFR 50.73 subparts (a)(2)(i)(B) and (a)(2)(iv). These events posed no threat to the public health and safety.

END OF ABSTRACT

BACKGROUND

A period of sustained dry northeasterly onshore winds (25-40 mph) began early on October 28, 1991 and continued until early October 30, 1991 when increased onshore winds (5 minute average speed of 51 - 56 mph) were experienced due to the combined effects of the northeasterly winds and the remnants of an offshore hurricane (Grace). The winds resulted in salt deposits on the 345 KV switchyard and insulators. The storm that produced the dry winds and resulting salt deposits on the switchyard insulators was rare. The rareness of the storm is important but more noteworthy is the period of the sustained dry northeastern onshore winds.

Seaweed was transported to the Intake Structure as a result of the winds and tides. Continuous operation of the traveling screens that are part of the Circulating Water System was necessary because of the seaweed. The Main Condenser vacuum gradually degraded as a result of the carryover of some of the seaweed onto the Main Condenser inlet tubesheets, and increased Circulating Water pump motor amperages were also noted. Reactor power was reduced to backwash the Main Condenser.

At 0521 hours, while lowering reactor power to backwash the Main Condenser, the Control Room received a Recirculation Pump Motor 'B' lower bearing low oil level alarm. After initial investigation of the oil level alarm, it was decided to shut down the recirculation pump. The Recirculation System 'B' motor-generator set/pump was shut down at 1154 hours while at approximately 47 percent reactor power. The shutdown was conducted in accordance with procedure 2.1.5 (Rev. 39) Attachment 1 Section G, "Controlled Shutdown With One Recirc Pump Out of Service". Drywell de-inerting began at 1210 hours in preparation of a Drywell entry

to further investigate the oil level alarm. After the shutdown, the oil level was found to be slightly low, i.e. approximately 0.25 inch below the level existing near the end of the recent refueling outage (RFO 8). The oil consumption was not excessive when compared to the level of the Recirculation System Loop 'A' pump motor. Control rod drive scram timing began at 1355 hours.

At 1631 hours, 345 KV switchyard air circuit breakers (ACBs) 103 and 104 tripped open. ACBs 103 and 104 opened as designed (due to a line 342 disturbance) and were reclosed by 1640 hours with line 342 still in service. Located at the end of this report is a figure depicting a simplified single-line diagram of the 345 KV switchyard including the ACBs and Startup Transformer (SUT).

At 1645 hours the Main Condenser low vacuum alarm cleared. However, the Circulating Water System pumps 'A' and 'B' motor amperage remained high and the Main Condenser vacuum was still poor. Therefore, preparations for an earlier shutdown were initiated. The Feedwater System pump 'A' and Condensate System pump 'A' were shut down and the Feedwater Control System was put into single element control (reactor water level) by 1701 hours, and the Intermediate Range Monitors were inserted. At 1705 hours, the 4160 "C Auxiliary Power Distribution System (APDS) buses including emergency Buses A5 and A6 were transferred from the Unit Auxiliary Transformer (UAT) to the SUT in accordance with Procedure 2.1.5.

At 1710 hours, ACB 104 was manually opened via control switch in the Control Room and the reactor mode selector switch was moved to the SHUTDOWN position while at approximately 30 percent reactor power. These actions were taken in accordance with procedure 2.1.5 Attachment 1 section G. The movement of the mode switch to the SHUTDOWN position resulted in the expected Reactor Protection System (RPS) scram signal and scram. The scram resulted in expected designed responses that included a decrease in the Reactor Vessel (RV) water level, an automatic opening of ACB 105 and trip of the Turbine-Generator. The RV water level decrease was the normal response to the scram. The decrease, to approximately -14 inches, resulted in expected designed responses that included an actuation of the Primary Containment Isolation Control System (PCIS) and Reactor Building Isolation Control System (RBIS). At 1711 hours, Emergency Operating Procedure EOP-02 was entered because of the indicated position of some control rods and was exited at 1714 hours after verifying the inserted position of all control rods.

The PCIS actuation included the following designed responses:

o The inboard and outboard Primary Containment System (PCS) Group 2 (two)/Sampling System isolation valves that were open closed automatically.

o The inboard and outboard PCS Group 3 (three)/Residual Heat Removal (RHR) System isolation valves remained in the closed position.

o The inboard and outboard PCS Group 6 (six)/Reactor Water Cleanup (RWCU) System isolation valves closed automatically.

The RBIS actuation included the following designed responses:

o The inboard and outboard Secondary Containment System (SCS)/Reactor Building ventilation supply and exhaust dampers closed automatically.

o The SCS/Standby Gas Treatment System (SGTS) Trains 'A' and 'B' started automatically.

At 1716 hours ACB 103 tripped open automatically as designed (due to a line 342 disturbance) and ACB 104 (in the open position) remained open as designed. ACB 103 was manually closed via control switch in the Control Room at 1720 hours. At 1729 hours, the RPS was reset and the PCIS/RBIS was reset at 1800 hours. The RWCU System was returned to service, the Reactor Building dampers were reopened and the SGTS was returned to normal standby service. The Main transformer/345 KV switchyard mechanical disconnects (T930) were opened and ACBs 104 and 105 were closed via control switches in the Control Room at 1740 hours. By 1849 hours, scram recovery and RPS reset were complete. Main Condenser backwashing activities resumed at 1850 hours.

At approximately 1730 hours, the last of several pre-evolutionary briefings was conducted regarding the manual initiation of the High Pressure Coolant Injection (HPCI) System and Reactor Core Isolation Cooling (RCIC) System in the event of a loss of offsite power.

EVENT DESCRIPTION

On October 30, 1991 at 1942 hours, a loss of preferred offsite power (345 KV) occurred. The loss of preferred offsite power occurred when ACBs 103, 104 and 105 tripped open and ACB 102 tripped open approximately 1.4 seconds later. The SUT became de-energized because ACB 102 (line 355) and ACB 103 (line 342) were open. The loss of preferred offsite power

resulted in the following:

o The APDS, energized by preferred offsite power via the SUT, became de-energized and resulted in the following:

o De-energizing/actuation of the RPS, PCIS, and RBIS that included:

o Multiple concurrent RPS scram signals. The control rod drives remained in the inserted position.

o PCIS (Groups 1,2,3, and 6) actuations that resulted in the automatic closing of PCS isolation valves that were open including the inboard and outboard Main Steam Isolation Valves (MSIVs) and Main Steam drain isolation valves. The closing of the MSIVs and drain isolation valves eliminated the Main Steam piping as a pathway for removing steam heat from the RV to the Main Condenser. The RV pressure was approximately 920 psig when the MSIVs and drain isolation valves closed.

o RBIS actuation that resulted in the automatic closing of the inboard and outboard Reactor Building/SCS ventilation supply and exhaust dampers and automatic start of the SGTS Trains 'A' and 'B'.

o Emergency Diesel Generators (EDGs) 'A' and 'B' started automatically and re-energized emergency Buses A5 and A6, and related AC powered load center buses, motor control centers, and distribution panels.

At 1942 hours, the RCIC System was manually started for RV level control purposes. During the start of the RCIC System, an overspeed trip occurred and is separately reported via LER 91-025-00. While the overspeed trip was being manually reset, the HPCI System was manually started for RV pressure control purposes and the RHR System was started in the Suppression Pool Cooling (SPC) mode. After the RCIC turbine overspeed trip was manually reset, the RCIC inverter was found to be tripped and is separately reported via LER 91-025-00. The RCIC inverter was reset and the RCIC System was manually started in the injection mode for RV level control at 1947 hours.

At 1953 hours, the Shutdown Transformer (SDT), that is the secondary source of offsite (23 KV) power to emergency Bus A5 and A6, became de-energized. This, in conjunction with the earlier loss of preferred

offsite power, resulted in a total loss of all offsite power and an Unusual Event was declared at 2003 hours.

At 2028 hours, Emergency Operating Procedure EOP-03 was entered due to the Suppression Pool bulk water temperature exceeding 80 degrees Fahrenheit (due to HPCI and RCIC turbine operation). A maximum Suppression Pool bulk water temperature of approximately 107 degrees Fahrenheit occurred at 2033 hours.

At 2030 hours, the HPCI and RCIC turbine-pumps tripped automatically as designed when the RV water level reached the high water level setpoint (calibrated at approximately +46 inches). At 2031 hours, the Main Steam/Target Rock two-stage relief valve RV-203-3B (pilot serial number 1040) was manually opened for pressure control in accordance with EOP-01 because the RV pressure was approximately 800 psig and increasing. The valve was manually closed at 2032 hours when the RV pressure was approximately 600 psig and decreasing. At 2033 hours, the HPCI and RCIC high water level isolations were reset and the HPCI System was manually started in the full flow test mode for RV pressure control and the RCIC System was manually started in the injection mode for RV water level control.

At 2142 hours, the SUT was returned to service when ACB 102 was manually closed via control switch in the Control Room. This action was taken after line 355 was re-energized by the regional power authority following a switchyard inspection and reset of protective relaying. This restored one source of preferred offsite power (345 KV line 355) to the SUT and APDS. The SDT was restored to service at 2210 hours. This restored the secondary source of offsite power (23 KV) to emergency Bus A5 and Bus A6.

At 2216 hours, safety-related 480 VAC Bus B6 was manually transferred from Bus B1 (powered by EDG 'A' via Bus A5) to Bus B2 (powered by EDG 'B' via Bus A6). Emergency Bus A5 was then transferred from EDG 'A' to the SUT. At 2225 hours, Bus B6 was manually transferred from Bus B2 to Bus B1 (powered by the SUT via Bus A5). Bus A6 was then transferred from EDG 'B' to the SUT, and EDGs 'A' and 'B' were shut down. At 2230 hours, the Unusual Event was terminated and the RHR System loops 'A' and 'B' were put into service in the Suppression Pool Cooling (SPC) mode.

At 2335 hours, a PCIS Group 6/RWCU isolation signal occurred when the RWCU System was being returned to service. The event is separately reported via LER 91-026-00. The PCIS was reset and the RWCU System was returned to service by 2339 hours. At 2336 hours, the Suppression Pool water level was noted as exceeding -3 inches and a Limiting Condition for

Operation (LCO A91-277) was entered. The LCO was terminated on October 31, 1991 at 0549 hours when the level was less than -3 inches (LR-5038).

On October 31, 1991 at 0026 hours, the PCIS Group 1 (one) circuitry was reset and the MSIVs were re-opened. This restored the Main Steam piping as a steam pathway from the RV to the Main Condenser. The HPCI System was removed from RV pressure control and shut down at 0029 hours. The RCIC System was removed from RV level control and shut down at 0035 hours. The Main Condenser mechanical vacuum pump was placed into service at 0041 hours.

At 0248 hours, a PCIS Group 6/RWCU isolation signal occurred when the position of the RWCU System valve MO-1201-85 was being adjusted. The event is separately reported via LER 91-026-00. The PCIS was reset and the RWCU System was returned to service by 0254 hours.

By 0257 hours, the RV pressure was reduced to less than 150 psig (146 psig) and the RHR System/Shutdown Cooling (SDC) suction piping high pressure isolation signal (calibrated at approximately 122 psig) cleared at 0340 hours.

By 0421 hours, the Suppression Pool water level had decreased to -4.5 inches (LR-5038) and EOP-03 (Suppression Pool water temperature) was exited at 0423 hours. At 0433 hours, the RHR System pump 'B' was shut down from the SPC mode of operation.

By 0927 hours, the RV pressure had decreased to approximately zero psig. At 1000 hours, the Main Steam drain line isolation valves were opened.

At 1632 hours, an RHR Loop 'B' pump was started for the SDC mode of operation, and by 1643 hours the RWCU System inlet water temperature (i.e. RV water temperature) was less than 212 degrees Fahrenheit and cold shutdown was achieved at that time. The other RHR Loop 'B' pump was also started for the SDC mode at 1700 hours.

The RV head vent valves were opened at 2300 hours.

Failure and Malfunction Report (F&MR) 91-446 was written to document the loss of secondary offsite power and F&MR 91-447 was written to document the loss of preferred offsite power and Unusual Event. The NRC Operations Center was notified of the Unusual Event in accordance with 10 CFR 50.72 on October 30, 1991 at 2007 hours. A followup telephone call to the NRC Operations Center was made on October 31, 1991 at 1915 hours to ensure the communications on October 30, 1991 at 2007 had been

recorded correctly. F&MR 91-466 was written to document the Suppression Pool water level exceeding -3 inches. Other F&MRs were written to document related events that occurred.

CAUSE

The causes and related corrective actions for the loss of preferred and secondary offsite power are separately described as follows:

1. Loss of Preferred Offsite Power (345 KV)

The 345 KV tranmission system (lines 342 and 355), 345 KV switchyard, Main Transformer, and SUT are equipped with protective primary, secondary, and backup (local and remote) relaying. This relaying consists of distance, high speed, fault detection (phase, phase to phase, phase to ground), stuck breaker (ACBs 102, 103, 104, 105), transfer trip, 345 KV bus differential, SUT differential (ACBs 102 and 103), Main Transformer differential (ACBs 104 and 105), and Turbine/Generator lock out (ACBs 104 and 105).

ACBs 103, 104, and 105 tripped open and line 342 became de-energized (via a transfer trip signal to remote switching devices) because of a flashover that occurred on a 345 KV insulator column on ACB 104. The flashover was the result of environmental conditions, i.e. salt deposits on the insulator, and the equipment functioned as designed in response to the flashover. The opening of ACB 103 and de-energizing of line 342 removed line 342 as one source of preferred offsite power to the SUT and left line 355 as the only source of preferred offsite power to the SUT via ACB 102.

Approximately 1.4 seconds after ACBs 103, 104, and 105 tripped open, time delay relay 62/5 (ACB 105 stuck breaker time delay relay) operated. The ACB 105 stuck breaker scheme is designed to generate a trip signal to ACBs 102 and 104 and to devices at the offsite (remote) end of line 355. Relay 62/5 is a Westinghouse type TD-50 time delay relay (set at 100 milli-seconds). The operation of relay 62/5 satisfied the protective circuit logic that generated a trip signal for ACBs 102 and 104 (already open) and devices at the remote (offsite) end of line 355. ACB 102 opened as designed, and line 355 became de-energized as designed as a result of remote switching.

Because ACB 105 opened as designed and was not slow in opening, the reason for operation of the ACB 105 stuck breaker circuitry was investigated. Remote, offsite fault analysis equipment indicated only

one fault (flashover on the ACB 104 insulator column) occurred. The root cause investigation on the ACB 105 stuck breaker circuit operation consisted of circuit analysis, component testing, individual relay testing, ACB 105 timing tests, overall relay and ACB system functional timing tests, and special tests of relays 62/5 and 50/5 (Westinghouse type SI) in the ACB 105 stuck breaker circuit. Except for a filter capacitor, all of the tests confirmed the components functioned as designed. The filter capacitor was found to have a loose connection that was subsequently tightened. The capacitor is designed to protect relays 62/5 and 50/5 from voltage transients or interference on the switchyard 125 VDC control power supply.

The loose connection could have allowed the relays to be susceptible to interference with a potential for false operation of relay 62/5. The root cause for the ACB 105 stuck breaker circuit operation is believed to be either a random signal of unknown origin or the infrequent development of some sequence of 345 KV transmission system electrical events which results in self excitation of the stuck breaker circuit through noise coupling. Typically, these conditions require special monitoring to identify and remedy the cause of the condition. A high speed recorder will be purchased and installed to monitor applicable switchyard circuitry. The installation of the recorder is expected to be completed in January 1992. To preclude the potential for future improper operations of relay 62/5, the relay will be replaced. The replacement is expected to be completed in December 1991. Also, a possible modification of the stuck breaker circuitry is being explored to reduce the susceptibility of false stuck breaker circuit operation.

The ACB 104 insulator flashover (which initiated the opening of ACBs 103, 104, and 105) was the first switchyard flashover since the insulators were treated with a covering (Sylgard) in the summer of 1987. Since that treatment, a significant reduction in insulator corona during adverse weather conditions has been noted. After the storm, the switchyard was inspected for evidence of flashover damage and no damage was found. The switchyard insulators were washed to remove salt deposits before Pilgrim Station was returned to commercial service.

2. Loss of Secondary Offsite Power (23 KV)

The SDT became de-energized as a result of electrical protection devices that actuated the SDT lockout relay. The lockout relay actuated because of a sensed fault on the offsite 23 KV distribution system. The direct cause was the environmental effects of the storm, i.e. winds that damaged trees, including one tree that fell onto the 23 KV line that powers the

SDT. The tree was located on Pilgrim Station property between the 23 KV distribution system and the SDT. Corrective action taken included the removal of the fallen tree. Long term corrective action planned includes periodic inspection of trees along the 23 KV lines on Pilgrim Station property for pruning or removal.

SAFETY CONSEQUENCES

These events posed no threat to the public health and safety.

The Standby AC Power (4160 VAC) System consists of EDGs 'A' and 'B' that are self-contained and independent of the offsite power sources. The safety objective of the Standby AC Power System is to provide a single failure proof source of onsite AC power adequate for the safe shutdown of the reactor following abnormal operational transients and postulated accidents. A loss of all offsite power is described in the UFSAR Chapter 14. The Chapter 14 analysis bounds the analyses in the UFSAR Appendix R that includes a loss of all offsite power to station auxiliaries. The EDGs started and provided power to Buses A5 and A6, and the related electrical system in response to the loss of power to Bus A5 and Bus A6.

The Core Standby Cooling Systems (CSCS) consist of the HPCI System, Automatic Depressurization System (ADS), Core Spray System, and the RHR/LPCI mode. The HPCI System provides water to the RV for high pressure core cooling. Although not part of the CSCS, the RCIC System is capable of providing water to the RV for high pressure core cooling, similar to the HPCI System. The ADS is a backup to the HPCI System and functions to reduce RV pressure to enable low pressure core cooling provided independently by the Core Spray System and the RHR/LPCI mode. The CSCS were operable.

The highest RV water level that occurred was approximately +55 inches. The level was less than the level (+112 inches) corresponding to the bottom of the Main Steam piping. The lowest RV water level that occurred was approximately -14 inches. The level was greater than the level corresponding to the CSCS low-low water level setpoint (calibrated at approximately -45 inches) and the level (-127.5 inches) corresponding to the top of the active fuel zone.

The highest Suppression Pool bulk water temperature that occurred was approximately 107 degrees Fahrenheit which occurred after the shutdown. The temperature was less than the maximum water temperature (120 degrees Fahrenheit) specified by Technical Specification 3.7.A.1.h during RV isolation conditions.

The highest Suppression Pool water level that occurred was approximately -1 inch (LR-5038). The level was less than the level corresponding to the maximum Suppression Pool volume of 94,000 cubic feet specified by Technical Specification 3.7.A.1.b. A Suppression Pool volume of 94,200 cubic feet corresponds to a level of +6 inches (LR-5038/5049) or 139 inches (LI-1001-604A/B). The level was also less than the settings of the level switches (LS-2351A/B) that control the Suppression Pool/HPCI pump suction valves.

Technical Specification 3.7.A.1.m specifies the Suppression Pool/Chamber be maintained between -6 to -3 inches which corresponds to a downcomer submergence of 3.00 and 3.25 feet, respectively. A Suppression Pool level of -1 inches corresponds to a downcomer submergence of 3.42 feet. The specified downcomer submergence values were based, in part, on reactor operation at full pressure conditions (i.e., approximately 1035 psig). The maximum RV pressure during the period when the Suppression Pool level was greater than -3 inches was approximately 600 psig (decreasing). The water level was decreased to less than -3 inches in approximately six hours. The Suppression Pool water level is logged daily in accordance with Procedure 2.1.15 (currently Rev. 87), "Daily Surveillance Log", Attachment 1 (daily log test #15). As part of this test, the Suppression Pool water level is verified to be greater than -6 inches and less than -3 inches (LR-5038/LR-5049).

This report is submitted in accordance with 10 CFR 50.73(a)(2)(iv) because of the automatic actuations of the RPS, PCIS, RBIS, and EDGs after the shut down.

This report is also submitted in accordance with 10 CFR 50.73(a)(2)(i)(B) because the Suppression Pool level of -1 inch, although less than the level corresponding to the maximum Suppression Pool volume of 94,000 cubic feet, was greater than the level corresponding to a maximum downcomer submergence of 3.25 feet.

SIMILARITY TO PREVIOUS EVENTS

A review was conducted of Pilgrim Station Licensee Event Reports (LERs) submitted since January 1984. The review focused on LERs involving a loss of preferred offsite power, or stuck breaker circuit operation. The reviewed identified LERs 89-010-00, 87-014-01, 87-005-00, 86-029-00, and 86-027-01 that involved a loss of preferred offsite power. LER 87-014-01 also involved operation of the ACB 104 stuck breaker circuit.

For LER 89-010-00, a loss of preferred offsite power (345 KV) occurred while shut down on February 21, 1989 at 0450 hours. At the time of the event, lines 342 and 355 were in service and powering the SUT via ACBs 102 and 103, and secondary offsite power (23KV) was available via the SDT. The loss of preferred offsite power occurred when ACBs 102 and 103 tripped open because of a cable fault in the underground portion of one of the SUT phase 'C' power cables between the secondary side ('X' winding) of the SUT and nonsafety-related 4160 "C Bus A4. The fault actuated the differential ground current relay that tripped lockout relay 186-4 and caused ACBs 102 and 103 to open. The EDGs started automatically and supplied power to the emergency buses and related electrical system. The cause of the cable failure was cable jacket damage during original cable installation. Corrective action taken included replacement of the failed section of cable.

For LER 87-014-01, a loss of preferred offsite power (345 KV) occurred while shut down during a severe storm on November 12, 1987 at 0206 hours. Just prior to the event, ACBs 102, 103, 104, and 105 were in the closed position, and transmission lines 342 and 355 were in service and powering the SUT. The SDT was not in service because of modification activities related to the blackout diesel generator. The event occurred as a result of a line 342 ground fault at 0205 hours and a line 355 fault approximately one minute later. The line 342 fault resulted in the opening of ACBs 103 and 104. ACB 104 opened slowly and caused the ACB 104 stuck breaker circuitry to operate and caused ACB 105 to open and a transfer trip signal to the remote (offsite) end of line 342. ACB 102 remained closed during that sequence (0205 hours) but tripped open approximately one minute later. The EDGs started automatically and supplied power to the emergency buses and related electrical system. ACB 102 opened as a result of the SUT differential protection circuitry. The circuitry operated because of an increasing voltz-per-hertz condition that tripped the differential protection relay. The relay functioned properly to lock out ACB 103 (already open) and to trip open ACB 102. The cause of the loss of preferred offsite power was a series of storm related faults in the 345 transmission system (lines 342 and 355) remote from the switchyard.

For LER 87-005-00 a loss of preferred offsite power (345 KV) occurred while shut down during a storm on March 31, 1987 at 0845 hours. Just prior to the event, ACBs 103, 104, and 105 were in service. ACB 102 was tagged open for maintenance and was not in service. The 345 KV transmission lines 342 and 355 were in service and the SUT was in service providing power to the APDS except for Bus A6 that was tagged out of service for maintenance. EDG 'A' was in standby service and EDG 'B' was tagged out of service for maintenance. The EDG 'A' started automatically and supplied power to emergency Bus 'A' and the related electrical

system. The loss of preferred offsite power occurred when ACBs 103 and 104 tripped open as a result of an offsite line 342 fault due to a broken static line. The location where the static line fell onto the 345 KV line 342 conductors was several miles from the switchyard. The broken static line was attributed to high winds and rain from the storm.

For LER 86-029-00, a loss of preferred offsite power (345 KV) occurred while shut down on December 23, 1986 at 1120 hours. At the time of the event, a de-energized switchyard phase 'C' insulator located between ACB 104 and disconnect 104B was being washed. The insulator washing was being conducted with ACBs 103 and 104 open, and the SUT was being powered from line 355 via ACB 102. During the washing of the insulator, overspray onto an energized switchyard insulator caused a loss of line 355 and the SUT became de-energized. EDG 'A' started and powered Bus A5 and the related electrical system. EDG 'B' had been removed from service and did not start, and the SDT re-energized Bus A6 and related electrical system. The root cause was a wind change causing overspray from the insulator washing to be carried over to energized insulators.

For LER 86-027-01, a loss of preferred offsite power (345 KV) occurred during a severe storm while shut down on November 19, 1986. Prior to the event the SUT was powered from lines 342 and 355 that were in service, and the SDT was in service. At 0819 hours, ACBs 103, 104, and 105 tripped open. At 0840 hours, ACB 102 tripped open and the SUT became de-energized at that time. The EDGs started and supplied power to the emergency buses and related electrical system. Subsequent investigation and inspections determined the most probable cause of the loss of preferred offsite power to have been arcing of the high voltage (345 KV transmission) lines due to ice and snow.

ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) CODES

The EIIS codes for this report are as follows:

COMPONENTS CODES

Breaker (ACBs) BKR
Capacitor CAP
Insulator INS
Relay, Instantaneous Overcurrent (50/5) 50
Relay, Time-Delay Stopping or Opening (62/5) 62
Transformer XFMR

SYSTEMS

Condenser System SG
Containment Isolation Control System (PCIS/RBIS) JM
Engineered Safety Features Actuation System JE
(PCIS, RBIS, RPS)
Emergency Onsite Power System (EDGs) EK
Heat Rejection System (Circulating Water System) KE
Main Steam System TA
Medium Voltage Power System (4.16 KV) EA
Plant Protection System (RPS) JC
RWCU System CE
Standby Gas Treatment System (SGTS) BH
Switchyard System (345 KV) FK

Figure omitted. (no title available)

10 CFR 50.73

BOSTON EDISON
Pilgrim Nuclear Power Station
Rocky Hill Road
Plymouth, Massachusetts 02360

George W. Davis
Senior Vice President - Nuclear November 29, 1991
BECo Ltr. 91-993

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Docket No. 50-293
License No. DPR-35

Dear Sir:

The enclosed Licensee Event Report (LER) 91-024-00, "Loss of Preferred and Secondary Offsite Power Due to Severe Coastal Storm While Shutdown", is submitted in accordance with 10 CFR Part 50.73.

Please do not hesitate to contact me if there are any questions regarding this report.

G. W. Davis

DWE/bal

Enclosure: LER 91-024-00

cc: Mr. Thomas T. Martin
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Standard BECo LER Distribution

*** END OF DOCUMENT ***